UPDATE ON THE STATUS OF LANDSAT COMMERCIALIZATION

HEARING

BEFORE THE

SUBCOMMITTEE ON
NATURAL RESOURCES, AGRICULTURE RESEARCH,
AND ENVIRONMENT

OF THE

COMMITTEE ON
SCIENCE, SPACE, AND TECHNOLOGY
HOUSE OF REPRESENTATIVES

ONE HUNDREDTH CONGRESS

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UPDATE ON THE STATUS OF LANDSAT COMMERCIALIZATION

WEDNESDAY, March 23, 1988

HOUSE OF REPRESENTATIVES,
COMMITTEE ON SCIENCE, SPACE, AND TECHNOLOGY,
SUBCOMMITTEE ON NATURAL RESOURCES, AGRICULTURE
RESEARCH, AND ENVIRONMENT,
Washington, D.C.

The subcommittee met, pursuant to call, at 1:35 p.m., in room 2318, Rayburn House Office Building, Hon. James H. Scheuer [chairman of the subcommittee] presiding.

Mr. SCHEUER. The Subcommittee on Natural Resources, Agriculture Research, and Environment will come to order. This afternoon we will examine the status of our Landsat commercialization effort.

We will review the recently renegotiated contract for the construction and launch of Landsat 6, and, in addition, we will receive testimony on the studies under way to determine the levels of technology necessary for the next generation of Landsats in order for us to compete effectively in the international arena.

When the committee reviewed the Landsat program just a year ago, we were on the verge of losing our preeminence in yet another area of high technology. Since the early 1970's, this country has pioneered the development of remote sensing from space at an expenditure over that period of time of perhaps $1.5 billion. Virtually from its inception, the program was marked by the administration's failure to provide adequate commitment and adequate funding.

As a result of last spring's hearing, we were convinced that a continued Landsat program involving a strong commitment to Landsat 6 and 7 was very important to the Nation in a number of ways, but not least of which are technological competitiveness and our own national security.

In the intervening months, together with our two witnesses, we spent countless hours in discussions aimed at saving this vital national resource. Through the untiring efforts of Mr. Norris and his colleagues from EOSAT and Mr. Pyke, who is with us again here today, and his staff at NOAA, we now have a renegotiated contract for the construction and launch of Landsat 6, and it is with great pleasure and an enormous sense of relief that I say those words.

This agreement represents a major step in assuring that the United States maintains its presence in the field of earth imaging. For the first time since we embarked on the commercialization of

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Landsat, the specter of uncertainty has been removed from this program and EOSAT is now able to compete internationally with an assurance of continuous data.

I am particularly pleased that the modified contract includes a substantial contribution on the part of the private sector. While I am relieved that this program has been finally placed on a firm footing, I do remain concerned about how close we came to turning over a unique technological capability to our foreign competitors. This country can't afford to abandon for a short term budget savings an important high technology industry. It is essential to this country's vital trade and security that we continue to move this program forward, not in a self-defeating, mincing manner but with a vision and a commitment to maintaining preeminence in the field of remote sensing.

I am convinced that our two witnesses share this commitment and this vision, and I congratulate them for their splendid efforts and their welcome testimony.

So with these words, let me ask Thomas Pyke, assistant administrator of the National Environmental Satellite Data and Information Service of NOAA, the National Oceanic and Atmospheric Administration, to testify.

We are happy to have your associate, Mr. John Hussey, and please take eight or ten minutes or such time as you may need and give us the highlights of your testimony, and then I'm sure we'll have some questions for you.

STATEMENT OF THOMAS N. PYKE, ASSISTANT ADMINISTRATOR FOR SATELLITE AND INFORMATION SERVICES, NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION, U. S. DEPARTMENT OF COMMERCE

Mr. PYKE. Thank you, Mr. Chairman. I appreciate this opportunity to appear before you today to tell you about our recent progress and our plans for the Landsat program.

With your permission, sir, I would like to have my prepared statement submitted for the record and then proceed to summarize my comments briefly.

Mr. SCHEUER. With no objection, so ordered.

Mr. PYKE. We have indeed recently completed negotiations with EOSAT for modifying their contract with the Department of Commerce so that we can get the Landsat commercialization program moving once again. At the same time, we have also taken significant steps toward the development of a long-term plan which is intended to assure a continued U.S. presence in civil land remote sensing.

The major modification of our contract with EOSAT will enable EOSAT to move ahead in the development of Landsat 6 and its associated ground support system. Consistent with the plan which we provided to the Congress last fall, the Landsat 6 spacecraft will use an advanced TIROS-N design and it will be launched on a Titan-II expendable launch vehicle estimated in June of 1991.

As a part of this modified contract, EOSAT has agreed to help the Government offset the total $220 million not to exceed cost for the development of the spacecraft and the ground system. An innovative pay-back arrangement has been agreed upon in which EOSAT will pay back as much as $10.8 million of this total $220 million cost, paying back to the Government the first $2.5 million of net earnings each year beginning with this calendar year.

Also relating to the total cost for the Landsat commercialization program, we are pleased that the Air Force has reduced the cost to NOAA for the launch of Landsat 6. This cost has been reduced to $36.5 million. That means that the total maximum cost for the development and launch of Landsat 6 and for the development for the associated ground system will be no more than $256.5 million. That is a million dollars less than the cost shown in the revised Landsat plan provided to the Congress last fall. With the EOSAT pay-back, the total cost to the Government could be as low as $245.7 million. So we are not only getting this program moving again but we are doing it in a way that minimizes the total cost to the taxpayer.

During our contract negotiations, EOSAT has agreed to waive their rights to market data from follow-on civil remote sensing satellites beyond Landsat 6 unless, of course, the Government decides to have EOSAT under this contract develop a Landsat 7 spacecraft. This gives the Government full flexibility to examine all follow-on options to Landsat 6. We can look at not only EOSAT and our present contract but all kinds of alternative arrangements in which we can attempt to come up with a commercialization solution that involves private sector investment to a much greater extent than in the present arrangement.

In addition to completing the negotiations with EOSAT in a way that is mutually acceptable to EOSAT and certainly to the Government in a way which we believe will provide for a continuing U.S. presence in land remote sensing on a commercial basis, we have gone ahead with our plans to develop a follow-on to Landsat 6 which we have termed an advanced commercial earth remote sensing capability.

The Department of Commerce has awarded three study contracts to KRS Remote Sensing, the Analytic Sciences Corporation, and the Egan Group to develop information and provide a basis for our development of a future civil earth remote sensing plan. These studies will address data marketing and applications and, indeed, will be very much market driven. In that context, they will investigate advanced instruments and supporting data processing capabilities that will match the anticipated market demands of the mid-1990's.

In order to launch those instruments, the studies will also investigate the size and nature of the spacecraft and the related launch capabilities for putting those instruments into orbit.

These studies will also address—and this is a very important component of our study—alternative Government-industry partnership arrangements with an emphasis on substantial industry investment. The studies will also investigate possible international cooperative partnerships in which we spread the investment and spread the benefits internationally from this program. Initial study results from these contracts are expected early this summer.

Other Federal departments, including Defense, Agriculture, and Interior, have been working with us as we formulated our study

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plan, and we expect them to work closely with us as we review the results of these studies and as we develop a plan for the future of civil earth remote sensing later this year.

Our successful negotiations with EOSAT for Landsat 6 and its supportive ground system will assure a continued U.S. presence in civil land remote sensing through the mid-1990's, and we believe that our contract studies, together with other inputs that we expect to receive from EOSAT, from industry, from many other sources, will help us to develop a viable plan for the mid-1990's and beyond for this important program. We look forward to continue to keeping this committee well informed as we develop this plan.

I thank you for this opportunity to report on the Department's Landsat commercialization program and, Mr. Chairman, would be pleased to respond to any questions you may have.

[The prepared statement of Mr. Pyke follows:]

TESTIMONY
OF
THOMAS N. PYKE, JR.
ASSISTANT ADMINISTRATOR FOR SATELLITE
AND INFORMATION SERVICES
NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION
U.S. DEPARTMENT OF COMMERCE

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U.S. HOUSE OF REPRESENTATIVES

MARCH 23, 1988

Mr. Chairman and Members of the Subcommittee:

I appreciate this opportunity to appear before you today to tell you about our recent progress and our plans for the Landsat program. We have recently completed negotiations with EOSAT for modifying their contract with the Department of Commerce so that we can get the Landsat commercialization program moving ahead once again. At the same time, we have taken significant steps toward the development of a long-term plan intended to assure a continued U.S. presence in civil land remote sensing.

SUCCESSFULLY CONCLUDED NEGOTIATIONS WITH EOSAT

I am pleased to report that the Department of Commerce and EOSAT have agreed on a major modification of the Government's Landsat commercialization contract that will

enable EOSAT to move ahead with the development of Landsat-6 and its associated ground support system. The Landsat-6 spacecraft will use an advanced TIROS-N design and will be launched on an Titan-II expendable launch vehicle in June 1991.

The modified contract calls for EOSAT to develop Landsat-6 and its ground support system for a cost not to exceed $220 million. EOSAT has agreed to an innovative pay-back arrangement to cover as much as $10.8 million of this cost through payment to the Government of the first $2.5 million of EOSAT net earnings each year, beginning with calendar year 1988. Assuming full EOSAT pay-back, which is contingent on continued earnings from marketing of data from Landsats 4, 5, and 6, the net cost to the Government for Landsat-6 and its ground support system will be reduced to $209.2 million.

In another important development, the Secretary of the Air Force has approved an additive cost policy for NOAA space launches on Titan-II vehicles, similar to existing arrangements for the use of Atlas vehicles for our polar meteorological satellite program. As a result, the cost to NOAA for the launch of Landsat-6 has been reduced to $36.5 million. The total maximum cost for the development and launch of Landsat-6 and its ground support system is thus $256.5 million. This is $1 million less than the cost shown

in the revised Landsat plan submitted to the Congress last fall. The cost to the Government could be as low as $245.7 million with full EOSAT pay-back from their net earnings.

In the negotiated contract modification, EOSAT has waived all rights to market data from follow-on civil remote sensing spacecraft beyond Landsat-6, unless the Government directs EOSAT to restart the development of a Landsat-7 spacecraft under this contract. This gives the Government full flexibility to consider all options for the future of the Landsat commercialization program beyond Landsat-6. Although this contract modification directs EOSAT to suspend the development of Landsat-7, the Government has the right to restart Landsat-7 development at a later date.

Through this contract modification, we have developed the basis for continuing the U.S. presence in civil land remote sensing into the mid-1990's.

ADVANCED CIVIL EARTH REMOTE SENSING COMMERCIAL SATELLITE SYSTEM

In addition to completing negotiations for the development of Landsat-6, we have taken major steps toward developing a long-term plan intended to lead to an advanced U.S. commercial earth remote sensing satellite system following Landsat-6. The Department of Commerce has

awarded contracts to three companies for studies that will address data marketing and applications, advanced instruments and data processing systems, spacecraft, launch options, and alternative Government-industry partnership arrangements with an emphasis on substantial industry investment. The studies will also address possible international cooperative partnerships. Initial study results are expected early this summer.

Other Federal departments, including Defense, Agriculture, and the Interior, have worked with us in developing this contract study effort. We expect these and other Federal agencies to assist us in assessing Government requirements for data from an advanced civil earth remote sensing system and in participating with us in developing an action plan for such a system later this year.

CONCLUSION

Our successful negotiations with EOSAT for Landsat-6 and its ground support system will assure a continued U.S. presence in civil land remote sensing through the mid-1990's. We believe that our efforts to develop a basis for an advanced commercial earth remote sensing system to follow Landsat-6, beginning with our contract studies, will lead to a viable plan for the 1990's and beyond. We look forward to keeping the Committee informed when this plan has been developed.

Thank you for this opportunity to report on the Department's Landsat commercialization program.

Mr. SCHEUER. Thank you very, very much, Mr. Pyke. I must say, you have kept us very well informed in the past. There has been excellent two-way communication, and we are fully confident that will continue in the future, and we very much appreciate the full and easy two-way communication that has taken place with your support.

Going off the record for a moment—

[Off the record.]

Can you tell us the nature of the Department of Defense contribution to this modified contract that you have described, and can you specifically discuss the launch commitment you have received from the Air Force?

Mr. PYKE. The Air Force has agreed to apply an additive cost policy to the cost to NOAA for having the Air Force launch not only Landsat 6 but also our meteorological satellites on the Titan-II launch vehicle.

Mr. SCHEUER. So it does extend beyond Landsat 6.

Mr. PYKE. That is our understanding, sir, and in this particular case the cost was reduced substantially from approximately $48 million for the Landsat 6 launch to $36.5 million.

Mr. SCHEUER. Now does this all represent a change in policy for DOD?

Mr. PYKE. No, it doesn't, not in our case, although a significant policy decision was necessary at the level of the Secretary of the Air Force, as we understand it. It essentially represented the continuation of their policy that has applied to their Atlas launches of our polar meteorological satellites in the past.

Mr. SCHEUER. What is the status of the $10 million contribution from DOD?

Mr. PYKE. The Defense Department is currently preparing a letter from Defense to the Commerce Department authorizing us to have access to the $10 million that was included in the defense appropriations this year for this purpose.

Mr. SCHEUER. We note that the contract provides that spacecraft costs exceed the $209-plus million cap set by the administration and approved by the Appropriations Committees by almost $11 million—$10.8 million, to be exact. This money is to be reimbursed to the Government by EOSAT after the first $2.5 million of net earnings for each year until it is paid. What percentage of EOSAT's revenue stream would this annual reimbursement represent?

Mr. PYKE. We estimate that the $2.5 million represents on the order of 15 percent of EOSAT's revenue stream for the current year.

Mr. SCHEUER. How dependent are EOSAT's revenues on the continued operation of Landsat 4 and 5? These satellites, as you very well know, are already operating beyond their designed lives and are sort of living on borrowed time. What is their current status, and how long do you think they are capable of hacking it, by hook or by crook?

Mr. PYKE. Mr. Chairman, these satellites have shown a great proclivity to last and last, but they are indeed beyond their expected lifetime by some extent at this time. We are doing everything we can to extend the lifetime, in fact, by cooperatively working with EOSAT, working to minimize the burden on them and to keep

operating only those portions of the spacecraft that are necessary to acquire data at any given point in time.

We don't know exactly when these spacecraft are going to fail, but the negotiated contract modification with EOSAT provides that we will receive a pay-back against that $10.8 million not only from the revenues from Landsats 4 and 5, and we believe that pay-back is probable, highly probable, for this year but that the pay-back process will continue after the launch of Landsat 6, and so that there will be a substantial pay-back from the revenues on the part of EOSAT in the Landsat 6 and beyond era.

Mr. SCHEUER. Well, now, do you think there is going to be a gap in Landsat coverage prior to the proposed June 1991 launch of Landsat 6? In other words, are these Landsats that are beyond their allotted four score and whatever it is—beyond their allotted time—are they going to last until 1991, and if there is a gap, what does it mean for EOSAT's ability to remain commercially viable? Is there anything you can do to prolong the life of Landsat 4 and 5, and if they are still operating in mid to late summer, will the administration request continued funding for Landsat 4 and 5?

Mr. PYKE. Mr. Chairman, we fully expect that there will be a data gap between the demise of Landsats 4 and 5 and the earliest possible time that EOSAT can have Landsat 6 ready to be launched. It's our belief that EOSAT will be able to sell data from their archives during that period of time and that, interestingly enough, the world awareness of the importance and availability of Landsat type data will be assured in part because SPOT Image, among others, will continue in business and many of the ground stations worldwide will continue to receive Landsat type data from those sources, so that the customer base will not go away and so that when EOSAT is ready with Landsat 6 the market will still be there and they'll be able to pick up with a viable commercial enterprise at that time.

It would be purely speculative to determine whether there is a—what the lifetime would be for Landsat 4 and 5, and we anticipate that we will reexamine that issue again this coming summer.

Mr. SCHEUER. What is the Landsat 6 spacecraft—let me put it differently. Does the Landsat 6 spacecraft represent a substantial improvement over Landsat 5—4 and 5?

Mr. PYKE. It certainly does.

Mr. SCHEUER. And, if so, tell us about it.

Mr. PYKE. It certainly does. The Landsat 6, as it's agreed upon in our contract modification with EOSAT, has an additional very important data gathering capability. It has a provision for a 15-meter resolution panchromatic band for acquisition of data. It also is to have at least two high capacity tape recorders on board that will eliminate the blind spot currently caused by the lack of sufficient data relay satellite coverage, which is the primary way that this data is brought back to earth at the present time.

The Landsat 6 will have a five-year design life, as compared to the three-year design life for Landsat 5.

Mr. SCHEUER. Thank you, Mr. Pyke.

I want to note that we have the presence of the full committee chairman, Congressman Roe of New Jersey, who has given such outstanding leadership to this whole effort to keep the Landsats

going and keep the information flowing. We never would have been where we are, we never would have made this kind of progress, if we hadn't had the very terrific and dynamic leadership of Chairman Roe of New Jersey.

Mr. Chairman.

Mr. ROE. I'm just sorry I'm not on the Appropriations Committee and we could get this job done right away.

Thank you very much, Mr. Chairman, for your generous encomiums on my behalf, but I want to also salute you for really dogging this matter through when everybody had given it up for dead but—how does that go? The death of the project was untimely reported, or something of that nature—we hope.

What I am interested is, what do you see in the Landsat 7? You know, we figured Landsat 6 would be somewhat mature from 4 and 5, but then we gave ourselves more flexibility in our thought processes as it related to 7, and we are particularly concerned with the Landsat 7 direction. Tell us something about that. In other words, I understand you're doing some studying and refinements. What are your plans on 7? That's a little bit much when we haven't quite got 6 yet approved, but we will.

Mr. PYKE. Well, Mr. Roe, we do have to think ahead, and the time scales do require us to plan quite a number of years ahead in this field.

Our feeling is that the actual content of a follow-on to Landsat 6, a follow-on spacecraft, will be largely determined by the results of the studies that we are having performed at this time. We don't yet have enough information in front of us as to the nature of the market in the mid-1990's, the extent to which additional capabilities on board a follow-on spacecraft will make a better commercial attempt at meeting the Landsat type requirements in the mid to late 1990's. We see this as being very much market driven, and the studies will take into account the technological options that are available and match them against the kinds of revenues that can be expected from aggregating the sales across many kinds of applications.

We are envisioning in the Landsat 6 follow-on effort an activity in which we depend very much on the private sector, and since we are clearly going to be facing continual budgetary constraints as we move into that era we are going to be looking into every possible way at opportunities to encourage and help make it possible for the private sector to put forth the major capital investment for the follow-on to Landsat 6 and for the ground system that goes with it, and therefore it's very important that we rely on the private sector through these studies and through open public solicitations in addition to those studies that we will be putting on the street, to rely on the private sector to obtain their input and their judgment as to just what should be on the follow-on spacecraft to make the most sense commercially in the late 1990's.

Mr. ROE. How are we going to compare on 7 in the work you are doing vis-a-vis the French SPOT program, the work that the Japanese are doing now, and also the Soviets? They are going to attempt to market, you know. Their resolutions are better than ours at the moment, which we are not supposed to say, but it's true. What are we going to do? Are we going to meet all of that on 7 or

do better? Have you any thought on that at all? It seems to me, if you don't do that, you are not going to have much of a competitive market to deal in.

Mr. PYKE. Well, we certainly want to have our U.S. commercial and remote sensing systems be competitive internationally, and that means we have to have a capability that is comparable or better to what is offered on the comparable satellites offered by—from other countries.

The issue of resolution is only one factor. In fact, we're going to be very interested in seeing the results of the studies that show us to what extent a higher resolution will lead to a larger market and to a greater potential for commercial success over the long term.

It turns out, even on Landsat 6—and I'm sure Mr. Norris, in a few minutes, will have some words on this subject. Even on Landsat 6, there is a possibility of flying at least one additional instrument, an ocean color instrument, which EOSAT has yet to make a business decision on and which may involve support from NASA, or partial support from NASA.

We're very pleased at the prospects for flying instruments on Landsat 6 even in addition to those that we have agreed upon in our contract with EOSAT since it should allow the U.S. to obtain a stronger presence in earth remote sensing even with Landsat 6, without waiting for Landsat 7, and allow us to be in a better position in terms of taking commercial advantage of this field.

Mr. ROE. Okay. Thank you.

Thank you, Mr. Chairman.

Mr. SCHEUER. Congressman McMillen.

Mr. MCMILLEN. Thank you, Mr. Chairman.

It's our understanding that EOSAT will be conducting its own study of the system. Do you feel that the study EOSAT is conducting will be of assistance to the NOAA-financed study on Landsat 7?

Mr. PYKE. We certainly do. We're looking forward very much to receiving the results of EOSAT's own study in this area, and we're going to be factoring those into our decision-making process as we develop our plan, just as we will factor in the results of the specific studies that we have commissioned and that we're paying for.

Mr. MCMILLEN. Will NOAA require any additional legislation for a follow-on Landsat spacecraft? Please give me an example.

Mr. PYKE. I would anticipate that new or different legislation will be required, as contrasted to the Landsat Commercialization Act that is currently on the books. The exact nature of that legislation will have to be determined as we complete the studies and as we develop our plan.

We certainly will keep the committee fully informed and look forward to working with the committee on the prospects for future legislation, especially since this committee was so instrumental in establishing the enabling legislation for the Landsat commercialization program in the first place.

Mr. MCMILLEN. My last question is, we understand that some people have suggested that the money remaining for Landsat which has already been appropriated in fiscal year 1987, which has not been obligated, can be used to solve NOAA's fiscal year 1988 funding shortfall as a result of the across-the-board reductions mandated by Congress. Do you have any response to that?

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Mr. PYKE. Mr. McMillen, what we're hoping for is that we have headed off that situation by working together with EOSAT to negotiate this contract modification in a timely manner ahead of the magic date that was set in the continuing resolution for this year and that by putting this agreement on the table that we will be able to obtain the approval of the Appropriation Committees of the House and the Senate so that we can move ahead, sign the contract, and get Landsat 6 going.

Mr. MCMILLEN. Thank you, Mr. Chairman.

Mr. SCHEUER. Congressman David McCurdy of Oklahoma.

Mr. MCCURDY. Thank you, Mr. Chairman.

I have been briefed by Mr. Pyke and Mr. Hussey, and even though there are always outstanding questions that only time will resolve, I appreciate their moving on this, and I appreciate the chairman having this hearing today.

I'm extremely interested in the testimony of the next witnesses, but I also think it is important that we as a committee make our mark and place our mark here today and am in full support, again, on Landsat. We have been the ones that have been carrying the ball, and I'm a little disturbed by what I'm hearing out of the Senate; they do not share our commitment to remote sensing; and that we are going to have our hands full.

I apologize for coming late. As was last year in our hearings on this very issue, we're right in the middle of our research and development markup today on Armed Services, and I'm running back and forth between subcommittees. But I would be interested, specifically for the record—and I know that the gentleman will be following soon—as to the plans in the future, NOAA's support and the contractor's support for those cooperative institutes and what they intend to do with those, and also the future plans of the ground stations which have some interest to this particular Member, and perhaps they can respond to that even though I may have to leave in the meantime.

But, again, at least we have a contract, and I commend the chairman of this subcommittee and also Mr. Roe for taking the bull by the horns a year or so ago in trying to bring this issue to a head and to force it along. Even though this is not as much as I would have asked for or as fully funded as I would have preferred, it is a step in the right direction, and we're going to try to ensure that the armed services arena and the intelligence community out there understand the potential of Landsat. Perhaps they, too, would increase and perhaps share their—our commitment and enthusiasm for this particular project.

Mr. PYKE. Mr. McCurdy, with regard to the cooperative institutes in the land sciences area, it is our intent this year—and we have already had a meeting with the cooperative institutes, and we have received proposals from each of them—it's our intent to have each of the cooperative institutes play a very key role with us in determining the future for the Landsat program beyond Landsat 6.

We are expecting to provide grants to each of the cooperative institutes to study specific aspects of civil land remote sensing beyond Landsat 6 and to have each of them contribute in their own way to the plan that we will be developing during this year.

With regard to ground systems, the actual ground system itself for Landsat 6 is up to EOSAT to determine in terms of the configuration and location of the components. We have specified in our contract the capabilities of the ground system as it relates to support of the satellites. We have offered in our contract modification the use of NOAA-owned equipment which is currently located at NASA-Goddard and can be moved from that site.

We have also offered to EOSAT the use of our NOAA command station in Fairbanks, Alaska, for Landsat 6 telemetry and command functions, and the use of that station by EOSAT would be on a reimbursable and noninterfering basis with the other activities that are supported by that station.

Mr. MCCURDY. In the past, it has been stated, both in the Senate and in this body, that there is merit in trying to secure a ground station location somewhere in the center of the United States in order to have proprietary security but also national security on that down-link. That concept makes sense to you—does it make sense to you and certainly fit within the guidelines of the contract and the potential to put a ground station other than in Alaska or in Maryland?

Mr. PYKE. Well, first of all, the Alaska facility that we've offered for use by EOSAT will be used only for telemetry and command of the spacecraft, not for bringing data down. We're going to have to rely in large part on EOSAT here, since this is a commercial venture, and we don't presume to tell the private sector how to carry out the details of this program in the most commercially viable way. We're going to have to rely on EOSAT to determine the most effective ground system organization, including the determination of the actual locations for various ground system components.

Mr. MCCURDY. Well, I thank the gentleman for his response, and certainly we look forward to hearing from EOSAT. But I think, again, it's important that we—the president of the University of Oklahoma did his graduate work in remote sensing, and with the new energy center there and our concern for the viability of the petroleum industry not only domestically but internationally and also the fact that we have a significant agriculture base in our part of the United States. We are very optimistic about the potential customers and uses of Landsat data, whether it is agriculture forecasting or other discrimination and also in the exploration industry or fields for petroleum.

As the chairman of the full subcommittee has said and I have repeated oftentimes, the Japanese see this as an economic intelligence system, and we, too, need that viable system, and I think it needs to be aggressive and robust, and even though I'm not satisfied that we've gone far enough, considering what we had to play with, the deck that was dealt us, this is probably the best we can hope for at this stage, and, again, I appreciate the chairman and the work of all those people involved.

I yield back the time.

Mr. SCHEUER. Thank you very much, Congressman.

Mr. Pyke, are you familiar with the details of EOSAT's marketing efforts?

Mr. PYKE. I have a general awareness of—

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Mr. SCHEUER. Would you care to critique them for us and tell us how they could be improved, in your opinion?

Mr. PYKE. Mr. Chairman, I have been impressed with the comments that I have received from a number of organizations who are customers of EOSAT's both in the United States and abroad. I've received quite positive comments about the service EOSAT is providing, the timeliness of the service, EOSAT's responsiveness in providing searches through their collection of data, both existing data and data that they would take in terms of imagery for customers, and I understand that in the overall context that over the period of the last year or so that EOSAT has taken a number of steps in order to improve their overall marketing and service capability.

Mr. SCHEUER. Well, let me add that a year ago we had the definite impression that the marketing program of EOSAT was fairly pedestrian and unexceptional in every way, not very imaginative, not very creative. I have an impression today that it's got a lot more zip, a lot more flair, a lot more pizzaz, a lot more imagination. Now it may be that I was misinformed a year ago, or it may be that they have improved their performance. Do you have any idea which of those two it is?

Mr. PYKE. Well, I, too, have the impression that the EOSAT is working very hard to improve its marketing image and its marketing capabilities, and, as I say, the feedback I have—those customers of EOSAT I've talked with —is that they're pleased with the service and the capability that they're receiving from EOSAT.

Mr. SCHEUER. Well, we're all very pleased to hear that.

Do you know what NOAA is doing to assist EOSAT in carrying out the transition from a publicly owned system to a privately, commercially viable effort?

Mr. PYKE. Mr. Chairman, we continue, of course, under this contract to provide Government funds to pay for the Landsat 6 spacecraft, the instruments on that spacecraft, and to use Government funds to pay for the launch of the spacecraft. In addition, we assist EOSAT in their relationship with 13 foreign ground stations both in making the arrangements for receiving revenues from them and in maintaining their good relationships with those countries and the stations in those countries.

Mr. SCHEUER. Congressman McMillen.

Mr. MCMILLEN. Thank you, Mr. Chairman.

You mentioned something about contract studies involving Government-private partnerships. Would you elaborate on that a little bit?

Mr. PYKE. Yes. An integral part of our studies to develop information for us to use in formulating a long-term plan for civil earth remote sensing is to examine partnership alternatives involving the Government and the private sector. We'll also be examining partnership alternatives between private sector organizations in this country and those of other countries, especially if we find that there may not be sufficient motivation and sufficient venture capital in a sense available domestically to carry the venture off by ourselves without obtaining the assistance and cooperation of partners in other countries.

Our hope is that through the efforts of EOSAT, through the operation of Landsats 4 and 5, through the operation of Landsat 6, and the plans for Landsat 6, that we have learned a lot from both a theoretical and practical standpoint about the utility of Landsat type data, and that there's enough information available now and that will become available following the studies that we've commissioned in order to provide a good basis for individual companies and consortia of companies to project the business sense of investing substantially private funds for the capital costs of a follow-on Landsat or Landsat type spacecraft and for the ground system that goes along with it.

We're—as I mentioned earlier, we're assuming that we're going to be dealing over the next several years continually with very tight budget constraints in terms of Federal funding, and for the good of the country, for the presence—continued U.S. presence in land remote sensing under these conditions, we feel it's very important that we make every effort to formulate together with the private sector a way in which the private sector will put up the capital for the future civil earth remote sensing systems and that the Government continue its purchase of data to satisfy its requirements. That's the direction in which we're moving, and we're seeking guidance across the board from the private sector where the action is, from industry, to help us formulate these plans.

Mr. MCMILLEN. Where do these studies stand right now?

Mr. PYKE. We have just within the last few weeks awarded the three study contracts, and we've moved ahead very quickly to do this once funds were made available last fall. This was on a fast track. We've just awarded, and we've pushed the contractors into agreeing to provide the results to us this June.

Mr. MCMILLEN. Can you just elaborate on those three contracts very briefly? Just give me an idea of what's entailed there.

Mr. PYKE. Yes. Two of these contracts are comprehensive contracts. These are ones with KRS remote sensing and the Analytic Sciences Corporation. They cover all aspects of the market in the mid-1990's and beyond for Landsat type data, for the types of sensors or instruments that will be required on spacecraft to satisfy those market demands, for the size and type of spacecraft necessary to handle those instruments, and for the launching capability necessary to launch those spacecraft. These studies will also cover the alternative financing arrangements including the new and perhaps innovative arrangements involving the private sector to get maximum possible private sector investment in the system.

Now there's a third study, and that's being conducted for us by the Egan Group, which is looking solely at the alternative financial options. These companies will be reporting back to us. We will be combining their results with other information available to us as we develop our plan.

I might mention, if I may, one additional thing that we are doing is to put out a request for information at large but aimed very much at the private sector in which we ask companies that have an interest in the future of this important program to come forward to us and share their ideas either individually or collectively, and to the extent that the information they're willing to share with us is not proprietary, we'll make that available to our contrac-

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tors to help them in their studies. To the extent that it is proprietary and must be treated by the Government as such, we will make sure that that data is factored into our development of a plan later on this year. And, finally, we have already begun to work very closely with other Federal agencies, and we intend to involve DOD, Agriculture, Interior, and other agencies very closely with us as we determine how they can and should benefit from land remote sensing in the late 1990's.

Mr. McMillen. Well, Mr. Chairman, I was just interested in seeing where they were heading in terms of soliciting the private sector to be more involved here. It may very well be that, given the scarcity of Federal funds, with our deficits and so forth, that we have a role to play creatively in ITC's or something along that line to ensure our remote sensing capability and other space capabilities which are very, very important. So I just wanted to follow up on that a little.

Thank you.

Mr. Scheuer. Well, Mr. Pyke, you've done a very impressive, very outstandingly competent, vigorous job in moving this agreement forward and moving the program forward, and all of us who know you and work with you are indebted to you.

I want the record to show your unstinting efforts to keep us informed, even when it requires you to make a call from various parts of Europe at 8 or 9 o'clock in the morning your time and 3 a.m. our time.

[Laughter.]

We really do appreciate your really terrific inputs in moving this program ahead.

We'd like you to give us executive summaries, if you can, of these several reports that you've mentioned. Can you do that?

Mr. Pyke. We certainly can, Mr. Chairman.

Mr. Scheuer. All right. And we'd also like to reiterate our standing request for a copy of your reprogramming proposal, more or less contemporaneous with its delivery to the Appropriations Committee. Can you do that?

Mr. Pyke. I'm sure the Department would be pleased to do that, yes, sir.

Mr. Scheuer. Great. We've talked about it a few times; this time we'd really like to get it.

All right. We appreciate what you've done, we look forward to your continuing outstanding leadership efforts, and we thank you for testifying here this morning.

Mr. Pyke. Thank you very much, Mr. Chairman.

Mr. Scheuer. So let's have our next witness, Mr. Peter Norris, vice president of EOSAT, come to the witness table.

Well, we can say the same thing to you, Mr. Norris. You've been outstandingly cooperative with us, and we've had an excellent flow of communication both ways with you, and we appreciate that very much, and we also would like to recognize the leadership of Chuck Williams, who is president of EOSAT, sitting here in the front row. He has been very cooperative and very helpful when we've needed his help.

So why don't you take the same eight or ten minutes that your predecessor took here, and then I'm sure we'll have some questions for you.

STATEMENT OF PETER NORRIS, VICE PRESIDENT, EOSAT

Mr. Norris. Thank you, Mr. Chairman.

With your permission, I have a brief summary statement which I would like to read this afternoon. I have previously submitted a more extensive written statement and request that it be included in the record of these proceedings.

I'm pleased to appear before you today to report on the status of Landsat commercialization and on EOSAT's efforts to move this program forward. EOSAT remains firmly committed to the goal of Landsat commercialization and continues to believe, as we did in 1985 when our contract was executed that commercial independence is attainable with the right combination of private ingenuity and Government-industry cooperation.

In particular, we believe that our revised contract with the Department of Commerce which has been submitted to the House and Senate appropriations subcommittees for review constitutes an important step forward in this process. We are hopeful that it will be approved promptly so that funding may be released for the continuation of the Landsat commercialization program.

In the past two and a half years since the execution of our contract with the Department of Commerce, EOSAT has undertaken substantial initiatives to develop the market for Landsat data. I would like to outline briefly some of our achievements during this period.

EOSAT has introduced several new lines of state-of-the-art digital products. These products, together with a new user-friendly data format, make Landsat thematic mapper data more flexible and easier to use. The response from the user community thus far has been terrific.

In July, EOSAT will introduce a new line of state-of-the-art thematic mapper color photo products based on new laser recording technology. These products will be sharper in appearance and contain more information for the end user. The past two years have seen a tremendous growth in the international interest and participation in the program. It's likely that by the mid-1990's there'll be a total of 25 Landsat-type receiving stations worldwide.

In addition, EOSAT has also developed its own international sales representative network which now covers over a dozen countries in Europe, the Middle East, and the Far East, which is also expected to grow substantially in the future. We've also made a number of arrangements for marketing data collected by the foreign ground stations, including an agreement with the People's Republic of China to market their Landsat data collected through their station.

In 1987, the Congress passed legislation which will enable EOSAT to provide data grants for critical research and development work in the field of Landsat applications. We are most grateful to this committee for the key role that it played in the adoption of this very important legislation.

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EOSAT is also helping to promote the value-added industry through joint advertising and conference participation, business arrangements for new products, and through publication of directories of the value-added industry. We're particularly pleased at this point to see major U.S. corporations such as Eastman-Kodak making a substantial investment in the future of remote sensing.

EOSAT has forged a partnership with NOAA and NASA to put a new wide field sensor, known as Sea-WiFS, on Landsat 6. We are also looking at the possibility of including a five-meter resolution, multi-spectral sensor, which we have nicknamed Star, also to fly on Landsat 6. Our market survey indicates that the improved spacial resolution offered by this new sensor will be extremely attractive to the marketplace.

Because of our belief that a robust Landsat 7 will pave the way for fully commercial Landsat 8 and beyond, EOSAT initiated its own study of the technical and market factors which will shape Landsat 7. This study, which includes over a dozen user surveys, market assessments, and working groups, has identified four key data sets of interest to the user community, and Landsat 7 is being designed to provide each of these new data sets.

Now with these new EOSAT initiatives in place and with a firm commitment by the Government to the completion of Landsat 6, we believe that all of the ingredients necessary for successful commercialization of Landsat are now in place. In this regard, I would like to thank the members of this committee for their strong support of the Landsat system over the past two and a half years.

We are particularly grateful for your efforts on behalf of the program, Mr. Chairman, and for those of Congressman Roe as chairman of the full committee. We believe that strong Congressional support has been a critical factor in the development of the new revitalized Landsat program which is reflected in the revised agreement between EOSAT and the Department of Commerce.

Mr. Chairman, I would be pleased to answer any questions.

[The prepared statement of Mr. Norris follows:]

STATEMENT OF

PETER M. P. NORRIS

EXECUTIVE VICE PRESIDENT

EARTH OBSERVATION SATELLITE COMPANY

BEFORE THE

SUBCOMMITTEE

ON

NATURAL RESOURCES, AGRICULTURE RESEARCH AND ENVIRONMENT

OF THE

COMMITTEE ON SCIENCE, SPACE AND TECHNOLOGY

U.S. HOUSE OF REPRESENTATIVES

MARCH 23, 1988

Mr. Chairman and members of the Committee, my name is Peter M. P. Norris. I am Executive Vice President of Earth Observation Satellite Company, known in the industry as "EOSAT". I am pleased to appear before you today to report on the status of Landsat commercialization and on EOSAT's efforts to move the program forward to the ultimate goal of establishing satellite remote sensing as a viable commercial endeavor. EOSAT remains firmly committed to this goal and continues to believe, as we did in 1985 when our contract was executed, that commercial independence is attainable with the right combination of private ingenuity and government-industry cooperation. In particular, we believe that our revised contract with the Department of Commerce, which has been submitted to the House and Senate Appropriations subcommittees for review, constitutes a critical step forward in this process. We are hopeful that it will be approved promptly, so that funding can be released for the continuation of the Landsat commercialization program.

Throughout its existence, commencing even before the execution of EOSAT's contract with the Government, the Landsat commercialization program has been beset by funding difficulties. As you know, funding for the next generation of spacecraft and associated ground system, necessary for continuation of the Landsat program, ran out in October, 1986, and construction of these items has now been marking time for more than a year. Fortunately, however, we need not dwell on these difficulties today, as I am pleased to report to you that during this period EOSAT has not stood still. We have, rather, been working with the resources which are available to us to develop new programs, new products and a new international marketing network, all of which will provide a firm base on which the commercialization process can go forward.

In this regard, I would like to outline briefly some of the accomplishments which EOSAT has achieved in the past eighteen months in the following areas:

1. State-Of-The-Art Digital Products
2. State-Of-The-Art Photographic Products
3. International Activities
4. Applications Development Programs
5. The Value-Added Industry
6. New Data Sets For Landsat 6
7. Planning for Landsat 7

State-Of-The-Art Digital Products

EOSAT has recently conducted an extensive survey of the user community in order to determine the proper mix of digital products to be offered. This survey suggested that a range of new products was desired, and EOSAT has introduced several new lines of digital Thematic Mapper (TM) data products, including Geo-Coded Data, Floating Scenes and Floppy Disk Data Products as a result.

Geo-coded digital data products are designed to enable users to "tailor" the unenhanced TM data to the parameters of their existing system by choosing the map projection, pixel resample size and map rotation desired. In addition, EOSAT introduced a new scene size--a map sheet scene--which corresponds to the existing U.S. Geological Survey 1:100,000 map sheets. Simply put, Geo-coded data allows the user to relate digital TM data to their particular base map without substantial data processing or computer ingest time, resulting in a higher quality end product.

In order to promote the most flexible possible digital data set, EOSAT has also introduced the Floating Scene concept which enables users to "frame" their area of interest, rather than having to buy standard satellite data products which may provide a lot of data outside the user's area of interest. Finally, in order to tap into the burgeoning PC-Based Image Processing and Geographic Information Systems Market, EOSAT is now offering small windows of TM data on floppy diskettes. These small windows can be centered around a user's particular area of interest. This product will be useful for example, to users who are working with small areas, and for training and education.

For all of these products, EOSAT has adopted a user-friendly data format which reduces computer entry time and makes the data much more easily manipulated than the previous format. These new products and the new data format, make Landsat TM data more flexible and easier to use. The response, from the user community thus far has been terrific.

State-Of-The-Art Photographic Products

In July, EOSAT will introduce a new line of Thematic Mapper Color photo products. These products will be based on new laser recording technology which enables EOSAT to generate film negatives directly from digital data. In addition, they will also be applications specific in that they will be developed to bring out the characteristics of the imagery which are of the greatest interest to a particular user. The resulting products will be sharper in appearance and contain more information for

the end user.

International Activities

The past two years have seen a tremendous growth in international interest and participation in the Landsat program. In addition to the 12 foreign ground receiving stations which EOSAT now serves worldwide, there are currently four more under construction, and plans for recommissioning two stations which are currently off-line. Plans for at least three other stations are also being developed. It is likely that by the mid-1990's there will be a total of 20-25 Landsat type receiving stations worldwide, representing an international investment in the Landsat program of over $500 million. These stations constitute the core of a developing international remote sensing system in that most of these stations will also receive SPOT data and many will be capable of receiving data from the Japanese, Canadian and European remote sensing satellites. The United States provided the impetus for the development of this remote sensing infrastructure, and with the renewed Landsat program, will continue to lead in the development of what is rapidly becoming a global system.

In addition to the Foreign Ground Stations, EOSAT has also developed its own international sales representative network. This network, which now covers over a dozen countries in Europe, the Middle East and the Far East represents a critical building block in the development of an international marketing effort. EOSAT expects this network to grow substantially in the future.

Finally, EOSAT has also made a number of arrangements for marketing data collected by the foreign ground stations. Of particular note is an arrangement with the People's Republic of China which makes EOSAT the exclusive marketing agent in the Northern Hemisphere for the sale of Landsat data collected by the Chinese ground station. Similar arrangements are currently being negotiated with a number of other ground stations. Finally, in order to minimize the impact of any data gap between Landsats 4 and 5, and Landsat 6, and to maximize EOSAT's ability to fully meet the needs of the user community, EOSAT is negotiating agreements with other providers of satellite data (Japan, Canada, and others) to market their data in the US and elsewhere.

Applications Development Programs

In 1987, the Congress passed legislation which enables EOSAT to provide data grants for the purpose of stimulating critical research and

development work in the field of Landsat applications. We are delighted that we are now able to participate, for example, with the National Aeronautics and Space Administration in its new Applications Program through the provision of data grants to the program's participants. In addition, EOSAT will be able to establish its own applications development program as a means of stimulating the type of market expansion which we believe is essential to the future of remote sensing as a commerical enterprise. We are most grateful to this committee for the key role that it played in the adoption of this very important legislation.

The Value-Added Industry

The Value-added Industry continues, from our perspective, to be the cornerstone of growth in the marketplace. Through joint advertising and conference participation, business arrangements for development of new products, and through publication of its Value-Added Industry Directory, EOSAT is enhancing the vitality of this budding industry. The key to its ultimate success--and in turn the ultimate success of the commercialization process -- is a strong committment to a reinvigorated Landsat program. EOSAT is particularly pleased to see major US corporations, such as Eastman Kodak, making a substantial investment in the future of remote sensing in the United States.

New Data Sets For Landsat 6

Early in 1986 NOAA announced that it would be unable to fly an Ocean Color Imager in the near future, and invited industry to form a partnership with the Government in order to fly this critically important mission. EOSAT accepted this challange and has forged a partnership with NOAA and NASA with the objective of putting a new wide field sensor known as Sea-WiFS on Landsat 6. This sensor will provide global ocean color and sea surface temperature data to the science and research community, while providing real-time data to operational users in both the public and private sectors. The Sea-WiFS sensor represents an excellent model of government/industry partnership in providing an essential data set for support of oceans related research worldwide and in developing a commercial market to support the goal of commercialization of the Landsat program.

As a result of an extensive survey of the user community, and in keeping with the new Presidential Space Policy which supports the development of systems competitive with or better than currently planned competitive foreign systems, EOSAT is also looking at the possibility of including a 5 meter resolution, multi-spectral sensor (nicknamed STAR) on

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Landsat 6. EOSAT's market survey indicates that the improved spatial resolution offered by this new sensor will be extremely attractive to the market place. Its inclusion on Landsat 6 will be based on technical feasiblity and the ability to commercially fund it as an addition to the Landsat 6 baseline mission.

The addition of the Sea-WiFS sensor will enable Landsat 6 to provide the most robust, commercially oriented satellite data set available anywhere in the world. The addition of the STAR sensor would further enhance EOSAT's competitive position in the early 1990's.

Planning for Landsat 7

EOSAT firmly believes that a robust Landsat 7 will pave the way for a fully commercial Landsat 8, and beyond. Because of this belief and because of our commitment to the commercialization of Landsat, in August, 1987 EOSAT initiated its own study of the technical and market factors which will shape Landsat 7. Our study is driven entirely by user information requirements. Over the past 24 months EOSAT has initiated over a dozen user surveys, market assessments and working groups aimed at defining critical data sets of importance to the user community. We believe that only by offering the data sets of interest to users will sales develop to support a truly commercial industry.

Currently , EOSAT has identified four key data sets of interest to the user community and Landsat 7 is being designed to provide each of them. These include:

1. Wide Field Data (Low Resolution--250 meters) with frequent coverage (every other day) for monitoring of global events such as drought and crop conditions;

2. Moderate Resolution Data to provide data continuity with the currently planned Enhanced Thematic Mapper, providing (at least) 15 meter panchromatic and 30 meter multi-spectral data every 16 days;

3. High Resolution Data to provide more frequent coverage of particular, discrete events on a worldwide basis. This application calls for 5 meter resolution data with the capability to point the sensor from side to side which enables repeat coverage on a daily basis, if necessary; and

4. Stereo Data to provide the capability to develop digital terrain

models on a global basis. This data will serve as the basis for development of topographic maps of the world and can be used to develop three-dimensional or perspective views of any part of the world from space. As a note, it is reported that less than 50% of the world is adequately mapped at this time.

EOSAT plans to develop a system which meets the dual challanges of the Landsat system; that is, providing the most advanced data sets possible while also providing for the successful comercialization of the Landsat system.

EOSAT remains firmly convinced that the original concept for commercializing the Landsat program is valid. All of our research and experiences in the marketplace indicate that the market is prepared for substantial growth. We have set the marketing infrastructure in place at EOSAT and, upon restart of the Landsat 6 program, expect continued and accelerated expansion of the market. What is needed now is a renewed commitment on the part of the Government and EOSAT to the Landsat program. The newly negotiated agreement between EOSAT and the Department of Commerce is a critical step forward in development of the government/industry partnership necessary for successful commercialization.

Mr. SCHEUER. Thank you very much, Mr. Norris.

Congressman McMillen of Maryland.

Mr. MCMILLEN. Thank you, Mr. Chairman.

Mr. Norris, it's our understanding that the innovative pay-back arrangement was originally suggested by EOSAT. My question would be, why did you decide to allocate a portion of your revenues for the construction of Landsat 6?

Mr. NORRIS. I would make the observation that each time that Mr. Pyke discusses something innovative with me it costs me money, and the reason was that we were at a stalemate. The Government was in a fix, and we were in a fix, and it seemed that we had to be extraordinarily flexible, and we went to our partners, General Motors and General Electric, and received permission to participate with an actual financial payment.

Mr. MCMILLEN. Is there any additional technology that you'll be able to provide for your $10.8 million contribution?

Mr. NORRIS. No. The $10.8 million is for the basic program.

Mr. MCMILLEN. Landsat 4 and 5 are currently operating beyond their design life. What do you consider to be the probable expiration dates of their usefulness?

Mr. NORRIS. We have done a reliability assessment of this, and it seems to us that the spacecraft will continue to operate through the end of calendar year 1989.

Mr. MCMILLEN. Calendar year 1989?

Mr. NORRIS. Yes.

Mr. MCMILLEN. What is the range of time we are looking at in terms of a data gap between the expiration of 4 and 5 and the point in which 6 will come on line?

Mr. NORRIS. We're now assuming that Landsat 6 would be launched in June of 1991. So this would be approximately an 18-month data gap if Landsat 4 and 5 expire at the end of 1989.

Mr. MCMILLEN. Do you have any ideas how we can minimize that data gap or what we can do to offset that?

Mr. NORRIS. Well, we have an ongoing program with NOAA. They're working very closely with us to manage the existing assets, Landsat 4 and 5, in a way that will cause them to last as long as possible as operating systems, and I think that will help a great deal.

Mr. MCMILLEN. The question I have is what level of international participation is involved in Landsat operations currently.

Mr. NORRIS. At the present time, we have 13 ground stations that are in full operation, and we have 4 under construction, and there are 2 in which we are, again, working with these foreign countries to have them restart their ground stations. So it's a considerable number even today.

Mr. MCMILLEN. My last question: Is EOSAT marketing data from sources of remote sensing imagery other than Landsat?

Mr. NORRIS. At the moment, we are not. As I mentioned in my testimony, we are marketing data from the Chinese, but it is Landsat data, and I am in the process of discussing with the Canadians and with the Japanese to have data sets available that EOSAT might market in the United States, but we have no such arrangements at the moment.

Mr. MCMILLEN. What's the rationale for that?

Mr. NORRIS. Well, part of it has to do with our view of the remote sensing industry overall, that we are but a part of the remote sensing industry, and, more to the point, we do expect that there will be a data gap, and this would help us, I think, maintain our own infrastructure if we had some other products to sell in that period when we don't have our own data stream.

Mr. MCMILLEN. Thank you, Mr. Chairman.

Mr. SCHEUER. Congressman George Brown of California.

Mr. BROWN. Thank you very much, Mr. Chairman, and I'm sorry that I came in late and missed most of your testimony, Mr. Norris.

I am concerned, and I think all of us have been for some time, about the competitiveness aspects of your operation. I would like to know how you evaluate your relative posture with regard to those firms which will be marketing SPOT data or other international data which will become increasingly available in the near future.

Mr. NORRIS. Our basic business plan always assumed that there would be a SPOT system, and we knew since 1983 what that system would be capable of, and so it is not a surprise to us that we have this kind of competition.

I think the only thing that surprised us about SPOT as competition is how quickly they have garnered what we would apportion to them as their share of the market, and upon reflecting on this, I have come to the conclusion that this was because they have quite adroitly managed to make use of the superstructure that has been provided by the U.S. program.

An example of this is that the ground stations around the world that receive SPOT data turn out to be my ground stations from the Landsat system, and so they are making quite effective use of the superstructure that has been set up by NASA and NOAA and EOSAT.

Mr. BROWN. Well, I want to pursue that a little bit. Do they have a market advantage stemming from the fact that they can offer a somewhat better resolution, 20 versus 30, or whatever?

Mr. NORRIS. They definitely have an advantage in terms of improved spacial resolution; that's correct.

Mr. BROWN. Do you perceive any possibility as a result of the President's new executive order on space or space policy announcement that we might be able to achieve some further reductions or increases in resolution on the part of the Landsat system, or would that be something that just the people who are interested in pictures from space, like the media, might take advantage of?

Mr. NORRIS. No. It seems to me that there is a place for increased spacial resolution, and, as I mentioned in my testimony, we have done an intensive study and a series of surveys in terms of the marketability of five-meter data and are much impressed with that to the extent that we are undertaking a plan now to provide such an instrument, possibly on Landsat 6.

Mr. BROWN. That would be a supplementary instrument on Landsat 6?

Mr. NORRIS. Yes, correct.

Mr. BROWN. And that is technically feasible for you to do?

Mr. NORRIS. It is technically feasible. The only problem that I have, which I expect to solve, is to sell this idea as a business proposition to our boards of directors.

Mr. BROWN. You've done marketing studies on this?
Mr. NORRIS. Yes, sir.
Mr. BROWN. Have you investigated the media market?
Mr. NORRIS. Yes, sir.
Mr. BROWN. Do you find any receptiveness there?
Mr. NORRIS. A great receptiveness.
Mr. BROWN. What would be, shall we say, the bureaucratic impediments to something like that?
Mr. NORRIS. We have made an attempt to assess that. We have had discussions with a number of principals involved in this, and it appears that there would be no impediments.
Mr. BROWN. Have you investigated the degree to which you might be required to get Defense Department approval and some degree of regulation over that activity?
Mr. NORRIS. Well, the technique by which we would assess this would be the application for a license, and that has not occurred as yet, the actual technical approval.
Mr. BROWN. Well, it would seem to me, without thinking too much about it, that if you could provide that type of high resolution data with, as you've indicated here, pointable sensors which could give you repeat coverage and stereoscopic imagery, why, the market situation might change very substantially in that situation.
Mr. NORRIS. Yes, I believe that's correct.
Mr. BROWN. Is it possible to get further information about the market studies that you've made, or is that something you consider proprietary at the present time?
Mr. NORRIS. It certainly is proprietary, but I would be willing to discuss this, yes.
Mr. BROWN. I've got top secret clearance, or I used to have.
Mr. NORRIS. Do you have a General Motors top secret clearance?
[Laughter.]
Mr. BROWN. That's more questionable.
Well, I think you probably are aware that members of this committee, including myself, feel that there is a very large market of multiplicity of types that need to be served with the kind of developments that you're proposed, and our fear has been that we would be losing out in this market to not only SPOT but to some of the new technologies coming out of Japan, and Germany, and other countries, and I presume it's part of your job to keep up with all these things.
Mr. NORRIS. Yes, and, I would add, as Mr. Pyke commented, that we have been very much encouraged in this direction by this committee. In other words, last summer when we were discussing Landsat 7, this committee and the full committee encouraged us to think about being competitive and maintaining a technological advantage, and we have carried that to its illogical conclusion, perhaps, by thinking about this kind of an instrument as early as we can possibly get it, and what we're trying to do is find a way to—to get this kind of capability on Landsat 6, which is the earliest that we could fly it.
Mr. BROWN. And what is the date that you're expecting for Landsat 6?
Mr. NORRIS. We're expecting a launch date of June of 1991.

Mr. BROWN. You know, of course, that until—or at least this is one person's opinion—until the President's recent announced policy changes on space, you could not have, with any degree of certainty, proposed to do the kind of high resolution imagery that you're talking about.
Mr. NORRIS. Exactly right.
Mr. BROWN. So that marked a breakthrough in itself.
Mr. NORRIS. Yes. We're really thrilled at the prospect.
Mr. BROWN. I thought maybe you had talked to the President about it.
Mr. NORRIS. I have only spoken to the president of General Motors about it.
Mr. BROWN. I have no further questions, Mr. Chairman.
Mr. SCHEUER. Thank you very much, Congressman Brown.
How many commercial competitors will Landsat face, or will the Landsat data face—it's the data that's competing—by the end of this year? There'll be SPOT. How about a Japanese competitor?
Mr. NORRIS. The Japanese have a system called MOS, which is an ocean system, which is in some way a competitive system.
Mr. SCHEUER. And when will they be in business?
Mr. NORRIS. They are in business.
Mr. SCHEUER. And how about the European Space Agency?
Mr. NORRIS. Well, the European Space Agency will not be flying remotely sensed instruments for a number of years. I think the only other competition that we will have in the time frame you mentioned are the Russians.
Mr. SCHEUER. Not the Chinese?
Mr. NORRIS. No. No. The Chinese are using the Landsat system.
Mr. SCHEUER. Yes.
Mr. BROWN. Mr. Chairman, could you yield briefly?
Mr. SCHEUER. Of course.
Mr. BROWN. I just would like to ask him to amplify on the Soviet competition because of the fact that they have announced a willingness to sell five-meter resolution data, and I've seen some of that data.
Could you discuss that in a little more detail for the record for us?
Mr. NORRIS. Well, we—there is a commercial firm established, Soyuz-Carta. They are underway and improving in terms of their response commercially around the world. I've also seen this data which is quite good data, that five-meter. Their plans are to provide some digital data which will be very serious competition for us, and it seems to me, though they have announced that they would be able to do that by this date, that for certain by the end of this year—again, in 1988—they will be able to provide digital data of some importance.
Mr. BROWN. You mean their present product is strictly photographic, not digital?
Mr. NORRIS. It appears to be the case.
Mr. BROWN. But you can digitize the photographic images, can't you?
Mr. NORRIS. That can be done. There is a degradation.
Mr. BROWN. And a degradation.
Mr. NORRIS. Yes.

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Mr. BROWN. Okay. Do you think that they will be able to keep their promise to have the digital data within, we'll say, the current year or anywhere near that?

Mr. NORRIS. I believe so. It is good business, and I think it involves hard currency from outside of the Soviet Union. They seem to be very serious about this.

Mr. BROWN. But I have assumed that they did not yet have the full technological capability to do that since they've been using the film systems for so long, which must mean that they have entered a new technological era, shall we say.

Mr. NORRIS. Yes, it would seem to be the case.

Mr. BROWN. That's it.

Mr. SCHEUER. Thank you, Congressman.

What difference is there between the sensors that are on Landsat 4 and 5 and those of our foreign competitors whom you've just ticked off? Where does the competitive advantage lie?

Mr. NORRIS. Well, the competitive advantage in terms of spectral capability, which is the various bands that are contained in the data set, still is with the United States system, with the EOSAT system.

In terms of spacial capability—that is to say what we describe as five- and ten-meter capability—the French have an advantage on us in that regard, and so do the Russians.

When we fly Landsat 6, we are expecting to have within the basic instrument an ability to have 15-meter data, that is, a part of the basic system, and we would then be comparable to the French but with an additional spectral capability, were we able to fly the 5-meter, we would be pre-eminent once more. But we can't, so we ain't.

Mr. SCHEUER. Well, you have given up too early, sir.

Well, let me ask, by the time that we're up there operational with Landsat 6, what will be our competitive situation with the French and with the Japanese and with the Russians?

Mr. NORRIS. If we are able to fly a five-meter instrument, we will, in fact, be preeminent. We will have the infrastructure, and we will, in effect, be in a situation, in a good business situation, where, on the assumption that we can improve on Landsat 7, we can stay ahead of the competition in the rest of the world. We're really enthusiastic about that.

Mr. SCHEUER. Well, you're very, very encouraging, and certainly that result is devoutly to be hoped for.

During our last hearing last March, Deputy Director of OMB Joe Wright expressed concern over a perceived lack of demand for Landsat product, or at least as he perceived. He wasn't impressed with the demand out there for it. EOSAT sees a more promising future.

What are your annual revenue projections for Landsat data sales for the period from, well, next year through 1992?

Mr. NORRIS. Well, our revenues are in the order of $20 million at this time. We expect our revenues to decrease, when and if we have a data gap, to $10 million or less. When we have Landsat 6, which would be in 1991, the very first year the data revenue—or the revenues are expected to be in the order of $30 million rising to $45 million, and this is as a result of a couple of basic things. One

is the maturation of the remote sensing infrastructure around the world, an ability to make more effective use of these products, and the second thing is that we will be bringing new products to the marketplace. It's just a very exciting business prospect.

Mr. SCHEUER. Well, it is exciting to us, too.

Will the data gap between the expiration of Landsats 4 and 5 and the commencement of Landsat 6 affect EOSAT's competitive ability to market the data?

Mr. NORRIS. Only for that moment, or that year, or whatever it is when we don't have the ability to sell.

Mr. SCHEUER. Only for the exact gap.

Mr. NORRIS. Only for the exact gap, and what our mission is and what our basic business plan is, is to prepare the marketplace for an influx of new products with the arrival of Landsat 6.

Mr. SCHEUER. Well, during the gap, before the arrival of Landsat 6, do you think the data gap will cause current customers to shift to other sources of remote sensing imagery so that some of those new services, new technologies, will find a great big vacuum out there, at least for a time?

Mr. NORRIS. The only thing that I would fear in that regard is if someone stopped using the data altogether. If they shift to someone else, I'm going to have a new capability and a new product that will cause them to beg to buy my products when I'm ready. I'm sure of it.

Mr. SCHEUER. Well, that's the kind of American "can do" that we've been waiting for. We welcome it, and I don't suppose you would exhibit this kind of confidence if you didn't know that you could produce the mustard and really attract the business away from our competitors.

Both NOAA and EOSAT have studies under way exploring the design and concept of Landsat 7. Can you discuss EOSAT's? And perhaps you can discuss NOAA's, too.

Mr. NORRIS. Well, I can discuss a bit about EOSAT. EOSAT began the study of Landsat 7 as a result of the stimulus from this committee back in August of last year. So we have had an ongoing effort to sort out just what would be required for Landsat 7. We saw it as an opportunity, and the plan for completing the study is such that it will be available by the first of May.

Mr. SCHEUER. To NOAA.

Mr. NORRIS. To NOAA and—

Mr. SCHEUER. Do you have any assurances that NOAA is really going to crank it into their plans?

Mr. NORRIS. I certainly do. It's a brilliant piece of work, and they would be—they simply would be exercising folly to do otherwise. Especially the price is fantastic, which is zero.

Mr. SCHEUER. Well, Mr. Pyke, let me ask you, from your vantage point in the first row, are you going to crank Mr. Norris' report into your future plans and projects?

Mr. PYKE. Well, we certainly will. We're looking forward to it, and we plan to use that information as a key input to our efforts.

Mr. SCHEUER. Very good.

Mr. Pyke, why don't you come up for one second—okay?

Let me ask either of you how these studies complement each other, enhance each other, dovetail with each other, interface with

each other. Is this a case where the whole is greater than the sum of the parts?

Mr. NORRIS. I would love to say yes, but we have to prove that.

I think the way it works, in my mind at least, is that EOSAT has an insight into this because we have hands on and we've struggled, we've had a very ambitious business plan, we have had a great deal of support and guidance from the large corporations that own EOSAT, and we are going to reflect this in our study.

Now it seems to me that what NOAA is doing is something that would be very difficult for us to do, and that is to reach outside of EOSAT with some comparable heavy hitters, if you will, and get them to think about this and to make recommendations.

I think as a result of the merge of these two things, which is what we plan to do, that it will be a much more powerful set of direction for all of us, and I think that will help you in your decision-making process as well.

Mr. SCHEUER. Mr. Pyke.

Mr. PYKE. I agree with Mr. Norris that it will be quite helpful to all of us to have this mass of information available, the fact that it is being prepared by EOSAT based on their experience, and that which we will be obtaining from the contract studies that we have under way. We're looking forward to having this up-to-date information in front of us as we develop our plan for the future.

Mr. SCHEUER. Well, that's mighty encouraging.

Mr. Norris, does the modified contract represent to you a good deal for EOSAT and a good deal for the American public?

Mr. NORRIS. Yes, it certainly does. The only thing is, I would like it signed this afternoon, if you could speak to Mr. Pyke about this. It would be marvelous if we could just get on with it. I'm ready to go on with the program later this afternoon, if that could be arranged.

Mr. SCHEUER. Well, I think he's going to be ready to go by mid-afternoon, and he's disappointed that you're only going to be ready in the late afternoon.

Mr. NORRIS. That's good to hear.

Mr. SCHEUER. Well, now, tell me seriously, why is it a good deal for EOSAT and the public?

Mr. NORRIS. It's a good deal for EOSAT because we had a basic business plan that called for Landsat 6, and it's been held up, and we're anxious to get back to work and to have Landsat 6 and to launch it at the earliest possible time, and we think that's a good deal.

Mr. SCHEUER. Any last word, Mr. Pyke?

Mr. PYKE. We're certainly looking forward to getting this program moving again, and we, too, are looking forward to receiving the go-ahead from the Congress so that we can sign the contract modification with EOSAT.

Mr. SCHEUER. Mr. Pyke, Congressman David McCurdy of Oklahoma asked me to ask you a question, and the question is as follows: Are you aware that there is no funding in the NOAA fiscal year 1989 budget for the cooperative centers beyond the Landsat 7 studies, as planned in 1986 and in 1987? Is there any ongoing core funding beyond the Landsat 7 studies for 1989 and 1990?

Mr. PYKE. At this time, there is no funding included in the President's budget for fiscal year 1989 for the cooperative institutes.

Mr. SCHEUER. Nor for 1990, I take it.

Mr. PYKE. Nor for 1990.

In the past, we have taken some funding for these cooperative institutes for the Landsat operations funding, and this year, as I mentioned earlier, we are employing the cooperative institutes to help us as we all work together to look to the future and, in this case, having the cooperative institutes perform specific directed studies that will contribute to this information in front of us as we make our new plans.

Mr. SCHEUER. Congressman McCurdy has apparently voted on this roll call vote. I'm going to have to leave to get it in just a moment, but he's coming over here now, I'm told. I'd like to hold the record open long enough for Dave to get here.

Mr. BROWN. Are you looking at me for some reason?

Mr. SCHEUER. No, no. When the next bells go off, I'm going to leave, but I'm going to leave George Kopp here to close the hearing if Dave McCurdy doesn't arrive, but I'm told he's on the way after having voted.

While we're waiting a few minutes for Dave McCurdy, a couple of questions about your associated ground station. What kind of ground station is involved, and is this the most technologically desirable arrangement for a program that envisages a growing business beyond Landsat 6?

Mr. NORRIS. The associated ground station is a minimalist approach to this problem at the moment. It will, in fact, do the job for Landsat 6; it will support the commercial activity; but it is not a state-of-the-art ground station. It will not, for example, I think, be technically competitive with our competitors' ground stations, and the reason for this is, there is not sufficient funds—there are not sufficient funds to support the ground station that we originally envisioned.

Mr. SCHEUER. Well, what would be the estimated costs of the ideal ground station that you originally envisaged?

Mr. NORRIS. I think it would require an additional $20 million.

Mr. SCHEUER. Twenty?

Mr. NORRIS. Million.

Mr. SCHEUER. Twenty million.

Would the ideal configuration and placement of a ground station—let me start from scratch. What would be the ideal configuration and placement of a ground station to be constructed simultaneously with Landsat 6?

Mr. NORRIS. Well, ideally, as Congressman McCurdy mentioned earlier that we have talked about this from the inception, ideally, the ground station should be located in the center or central States of the United States.

Mr. SCHEUER. Okay. Congressman McCurdy hasn't arrived. What I'm going to do is adjourn the hearing but hold the record open for any further questions, because now we really have to go—for any further questions that Congressman McCurdy may adduce, and there being no objection, so ordered. The hearing will be kept open, and he'll address his questions to you either by phone or by mail,

and we'll hold the record open for another ten days or so until the answers come in.

I want to thank both of you for your fine contribution over the months and years. We really feel a sense of exhilaration that we're finally moving again. We're very grateful to you. Thank you for coming to testify before us today.

Mr. NORRIS. Thank you, Mr. Chairman.

Mr. SCHEUER. The hearing is adjourned.

[Whereupon, at 3:00 p.m., the subcommittee was adjourned.]

APPENDIX

Hearings on status of the Landsat program, March 23, 1988 - Subcommittee on Natural Resources, Agriculture Research and Environment.

Questions submitted by Congressman Dave McCurdy for Thomas Pyke, Assistant Administrator for Environmental Satellite, Data and Information Services, National Oceanic and Atmospheric Administration.

In 1986, at NOAA's instigation, three cooperative institutes were established at the University of Oklahoma, University of New Hampshire and the University of Nevada-Reno. These institutes were set up with memoranda of agreement that NOAA would provide basic, on-going core funding for five years or more.

1. Do you plan to implememt core funding for these cooperative institutes in FY89 funds, i.e., supplemental, administrator discretionary funds or other? If so, what will the funding level be?

2. Do you plan to request and support core funding for these institutes in the FY90 budget?

3. If not, what are your plans for supporting basic remote sensing research?

Questions for Pete Norris of EOSAT

In your earlier testimony, reference was made to the inadequacy of Goddard's Ground Receiving facilities to remain competitive for the Landsat 6 time frame.

1. Does EOSAT plan to develop a ground receiving station station Oklahoma?

2. If so, when?

3. What is needed to make this ground receiving station a reality?

The National Oceanic and Atmospheric Administration did not respond to the questions in writing submitted by Congressman Dave McCurdy.

RICHARD P. MROCZYNSKI Director, Public Affairs

EOSAT

PAO.0114.88

May 12, 1988

Curt Stanford, Technical Consultant
Committee on Science, Space, and Technology
Subcommittee on Natural Resources,
Agriculture Research, and Environment
H2-388 HOB Annex 2
Washington, DC 20515-6306

Dear Mr. Stanford:

The attached material is in response to the Subcommittee's hearings on the status of the Landsat program which were held on March 23, 1988. Specifically, these are Mr. Norris' responses to questions submitted by Congressman Dave McCurdy.

If you require any additional amplification or clarification, please do not hesitate to contact me directly.

Sincerely yours,

Richard P. Mroczynski

Richard P. Mroczynski

RPM:smt
Attachment

Earth Observation Satellite Company
4300 Forbes Boulevard • Lanham, Maryland 20706 USA • (301) 552-0545 • (800) 344-9933 • RCA TELEX 277685 LSAT UR

Responses to Congressman Dave McCurdy's questions to Mr. Norris

1. EOSAT's long-term commercialization plan has always included a domestic Landsat data receiving station in the mid-continent area. Norman, Oklahoma was our early choice for this site, and nothing has occurred over the past three years to change that decision.

2. The ground receiving station will be operating in January, 1991, six months prior to the launch of Landsat 6.

3. Under the current Department of Commerce contract for Landsat 6, there are not sufficient funds to implement a Norman, Oklahoma, ground station. Because of the importance of an Oklahoma receiving capability to Landsat commercialization, EOSAT expects to be successful in acquiring the necessary additional financial support to implement the Oklahoma ground station.